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| 09/819,211 | 03/28/2001 | Claus Neubauer | 2001P05653 US | 2357 |

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| EXAMINER |
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KJM, CHONG R

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| ART UNIT | PAPER NUMBER |
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2623

DATE MAILED: 05/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/819,211

Applicant(s)

NEUBAUER ET AL.

Examiner

Charles Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-13 and 15-24 is/are rejected.
- 7) ☒ Claim(s) 3 and 14 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 March 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 5.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Drawings

1. Figures 1-4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

The following quotation of 37 CFR § 1.75 (d)(1) is the basis of objection:

(d)(1) The claim or claims must conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description. (See § 1.58(a)).

2. Claims 5, 6, 16 and 17 are objected to under 37 CFR § 1.75 (d)(1) as failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention or discovery.

Referring to claim 5, the phrase “at least one template image comprises an image comprising a target marker, an image not comprising a target marker, and both” in lines 2-4 is unclear and appears to be redundant. It appears that the applicant intended the phrase to read “at least one template image comprises an image comprising a target marker, and an image not comprising a target marker. A similar objection applies to claim 16. Appropriate correction is required.

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Referring to claim 6, the phrase “the average” in line 2 lacks antecedent basis. It appears that the applicant intended the phrase to read “an average”. A similar objection applies to claim 17. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Chiu et al., U.S. Patent No. 5,696,838 (“Chiu”).

Referring to claim 1, Chiu discloses a method for detecting a marker in an image, comprising the steps of:

- a. selecting a marker recognition process based on a normalized correlation (col. 5, lines 14-17 and col. 8, lines 16-33. Note that the step of utilizing the marker recognition process based on a normalized correlation inherently selects it.)
- b. extracting image features associated with an input image of a ROI (region of interest) [col. 4, lines 23-59]
- c. comparing the extracted image features with a trained model associated with the selected recognition process to determine if a marker is present in the input image [col. 5, lines 10-25 and col. 6, lines 15-63].

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Referring to claim 12, see the rejection of at least claim 1 above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Krumm, U.S. Patent No. 6,611,622 (“Krum”) and Lee et al., U.S. Patent No. 6,678,404 (“Lee”).

Referring to claim 1, Krumm discloses a method for detecting an object in an image, comprising the steps of:

- a. selecting an object recognition process based on gray level histograms (col. 2, lines 40-61 and col. 19, lines 2-16. Note that the step of utilizing the object recognition process based on gray level histograms inherently selects it.)
- b. extracting image features associated with an input image of a ROI (region of interest) [col. 8, lines 40-45]
- c. comparing the extracted image features with a trained model associated with the selected recognition process to determine if an object is present in the input image (col. 8, lines 46-62).

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Krumm explains that an object is detected in the image, but does not explicitly disclose that the object is a marker. However, the Examiner notes that detecting markers were exceedingly well known in the art. For example, Lee discloses the step of detecting a marker in an image based on gray value histograms (col. 5, lines 34-42 and col. 6, lines 40-45).

Krumm and Lee are combinable because they are both concerned with objection detection processes based on gray value histograms. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the object of Krumm so that it comprises a marker, as taught by Lee. The suggestion/motivation for doing so would have been to enhance the flexibility of the system by providing the capability to detect a variety of different objects. Therefore, it would have been obvious to combine Krumm with Lee to obtain the invention as specified in claim 1.

Referring to claim 12, see the (103) rejection of at least claim 1 above.

5. Claims 2, 4, 5, 13, 15, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chiu et al., U.S. Patent No. 5,696,838 ("Chiu") and Wakahara et al., U.S. Patent No. 6,658,149 ("Wakahara").

Referring to claim 2, Chiu further explains that the trained model comprises at least one template image (col. 6, lines 48-63 and figure 5). Chiu also explains that the marker is determined to be present when a normalized correlation between the template image and the input image meets a threshold (col. 5, line 30-col. 6, line 13). However, Chiu does not explicitly disclose the step of normalizing the template image and input image with respect to brightness.

Wakahara discloses a normalized correlation marker recognition process that includes the steps of normalizing a template image and an input image with respect to brightness (col. 9, lines 37-40 and col. 10, lines 23-28), computing a correlation between the normalized template and the input image, and determining that a marker is present in the input image if the computed correlation meets a threshold (col. 8, lines 40-47).

Chiu and Wakahara are combinable because they are both concerned with detecting a marker in an image based on normalized correlation. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to include the normalizing step of Wakahara in the method of Chiu. The suggestion/motivation for doing so would have been to provide a correlation process that is independent from linear brightness change (Chiu, col. 8, lines 29-31). Therefore, it would have been obvious to combine Chiu with Wakahara to obtain the invention as specified in claim 2.

Referring to claim 4, Wakahara further discloses that the step of computing a correlation comprises computing $p = \sum_{allpixels} [I(i) * T(i)]$, where P comprises the correlation coefficient, I comprises the input image, and T comprises the template image (col. 10, lines 23-28 and col. 14, lines 63-68).

Referring to claim 5 as best understood, Chiu further discloses that the at least one template comprises an image comprising a target marker, and an image not comprising a target marker (col. 6, lines 48-63. Note that the “perfect 16x16 reference model” in figure 5 contains the entire cross and is interpreted as an image comprising a target marker, while the templates in Appendix II that do not contain the entire cross is interpreted as an image not comprising a target marker. Note that the entire cross is interpreted as the “target marker”).

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Referring to claim 13, see the rejection of at least claim 2 above.

Referring to claim 15, see the rejection of at least claim 4 above.

Referring to claim 16, see the rejection of at least claim 5 above.

6. Claims 6, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chiu et al., U.S. Patent No. 5,696,838 ("Chiu") and Wakahara et al., U.S. Patent No. 6,658,149 ("Wakahara"), further in view of Kang et al., U.S. Patent No. 6,031,539 ("Kang").

Referring to claim 6, Chiu and Wakahara do not explicitly disclose that the template image is computed from an average of a plurality of templates. However, this feature was exceedingly well known in the art. For example, Kang discloses a template image that is computed from an average of a plurality of templates (col. 3, line 65-col. 4, line 7 and figure 6).

Chiu, Wakahara, and Kang are combinable because they are all concerned with template matching techniques. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the template image of Chiu and Wakahara so that it is computed from an average of a plurality of templates, as taught by Kang. The suggestion/motivation for doing so would have been to increase the robustness of the recognition process (Kang, col. 4, lines 4-7). Therefore, it would have been obvious to combine Chiu and Wakahara with Kang to obtain the invention as specified in claim 6.

Referring to claim 17, see the rejection of at least claim 6 above.

7. Claims 7 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chiu et al., U.S. Patent No. 5,696,838 ("Chiu") and Wakahara et al., U.S. Patent

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No. 6,658,149 ("Wakahara"), further in view of Kunieda et al., U.S. Patent No. 6,307,914 ("Kunieda").

Referring to claim 7, Chiu and Wakahara do not explicitly disclose that the step of computing a correlation further comprises computing a correlation between at least one other normalized template image and the input image, and determining if a marker is present in the input image based on a maximum computed correlation.

Kunieda discloses the step of computing a correlation between a plurality of template images and an input image, and determining if a marker is present in the input image based on a maximum computed correlation (col. 12, lines 4-8 and figures 2 and 7).

Chiu, Wakahara, and Kunieda are combinable because they are all concerned with detecting a marker in an image based on a correlation process. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to include the plurality of templates of Kunieda, in the method of Chiu and Wakahara. The suggestion/motivation for doing so would have been to provide the ability to detect the marker in the image even if the image has been transformed (Kunieda, col. 11, line 62-col. 12, line 3). Therefore, it would have been obvious to combine Chiu and Wakahara with Kunieda to obtain the invention as specified in claim 7.

Referring to claim 18, see the rejection of at least claim 7 above.

8. Claims 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chiu et al., U.S. Patent No. 5,696,838 ("Chiu") and Wakahara et al., U.S. Patent No. 6,658,149 ("Wakahara"), further in view of Crill et al., U.S. Patent No. 6,445,822 ("Crill").

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Referring to claim 8, Chiu and Wakahara do not explicitly disclose the step of reducing the resolution of the input image and the template image by a predetermined factor prior to the comparing step.

Crill discloses the step of reducing the resolution of an input image and a template image by a predetermined factor prior to comparing the two images (col. 17, lines 19-26 and col. 21, lines 25-47).

Chiu, Wakahara, and Crill are combinable because they are all concerned with pattern recognition methods. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the input image and the template image of Chiu and Wakahara so that the resolution is reduced prior to the comparing step, as taught by Crill. The suggestion/motivation for doing so would have been to increase the efficiency of the pattern recognition process (Crill, col. 17, lines 26-28). Therefore, it would have been obvious to combine Chiu and Wakahara with Crill to obtain the invention as specified in claim 8.

Referring to claim 19, see the rejection of at least claim 8 above.

9. Claims 9, 10, 11, 20, 21, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Krumm, U.S. Patent No. 6,611,622 ("Krum") and Lee et al., U.S. Patent No. 6,678,404 ("Lee"), further in view of Mohan et al., U.S. Patent No. 6,310,964 ("Mohan").

Referring to claim 9, Krumm further discloses that the trained model comprises a sample image histogram comprising a gray value distribution of a sample image (col. 8, lines 46-58), and the step of comparing comprises the steps of:

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- i. generating an input image histogram comprising a gray value distribution of the input image (col. 8, lines 40-47)
- ii. comparing the input image histogram with the sample image histogram (col. 8, lines 47-58)
- iii. determining if an object is present in the input image based on the comparison of the two histograms (col. 8, lines 58-62).

Krumm does not explicitly disclose that the object is a marker. Lee discloses the step of detecting a marker as noted above.

Krumm and Lee do not explicitly disclose that the step of comparing the input image histogram with the sample image histogram comprises computing a distance measure between the two.

Mohan explains that it was exceedingly well known to compare two histograms by computing a distance measure between the two (col. 16, lines 50-60).

Krumm, Lee, and Mohan are combinable because they are all concerned with detecting an object in an image. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to compare the histograms of Krumm and Lee with the method of Mohan. The suggestion/motivation for doing so would have been to enhance the object recognition process (Mohan, col. 4, lines 26-35). Therefore, it would have been obvious to combine Krumm and Lee with Mohan to obtain the invention as specified in claim 9.

Referring to claim 10, Krumm, Lee, and Mohan do not explicitly disclose that the step of generating an input image histogram comprises generating a global histogram. However, Official notice is taken that global histograms were exceedingly well known in the art.

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Therefore, it would have been obvious to modify the histogram of Krumm, Lee and Mohan so that it comprises a global histogram, in order to enhance the marker recognition process by providing a comprehensive representation of the input image.

Referring to claim 11, Krumm further discloses that the step of generating an input image histogram comprises generating a plurality of local histograms (col. 8, lines 53-58).

Referring to claim 20, see the rejection of at least claim 9 above.

Referring to claim 21, see the rejection of at least claim 10 above.

Referring to claim 22, see the rejection of at least claim 11 above.

10. Claims 23, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chiu et al., U.S. Patent No. 5,696,838 ("Chiu") and Krumm, U.S. Patent No. 6,611,622 ("Krum").

Referring to claim 23, Chiu discloses a system for recognizing a marker in an image, comprising:

- a. an image capture module for extracting image features associated with an input image of a ROI (col. 4, lines 23-32)
- b. an image processor comprising a marker recognition processor for recognizing a marker in the input image based on a normalized correlation (col. 5, lines 14-17 and col. 8, lines 16-33)
- c. a database comprising trained template images which are used by the image processor during a recognition process (col. 6, lines 33-63).

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Chiu does not explicitly disclose a second marker recognition processor for recognizing a marker in the input image based on gray value histograms. However, this feature was exceedingly well known in the art. For example, Krumm discloses an object recognition processor for recognizing an object in an input image based on gray value histograms (col. 2, lines 40-61 and col. 19, lines 2-16). Krumm does not explicitly state that the object is a marker. However, Chiu's system is for detecting a marker in an image. Therefore, the combination of Chiu and Krumm provides a marker recognition processor based on gray value histograms.

Chiu and Krumm are combinable because they are both concerned with objection recognition systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to include the histogram based recognition processor of Krumm, in the image processor of Chiu. The suggestion/motivation for doing so would have been to increase the flexibility of the system by providing the capability of recognizing the marker in the image using multiple recognition techniques. Therefore, it would have been obvious to combine Chiu with Krumm to obtain the invention as specified in claim 23.

Referring to claim 24, Chiu further discloses that the system is implemented in an automated placement system for detecting markers on printed circuit boards (col. 6, lines 18-21).

Allowable Subject Matter

11. Claims 3 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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Conclusion

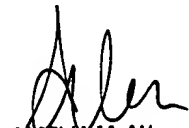
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Kim whose telephone number is 703-306-4038. The examiner can normally be reached on Mon thru Thurs 8:30am to 6pm and alternating Fri 9:30am to 6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ck
ck

May 7, 2004


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